Center Innovation Fund: JSC CIF

Brine Recovery in Containment (BRIC)

Completed Technology Project (2011 - 2013)

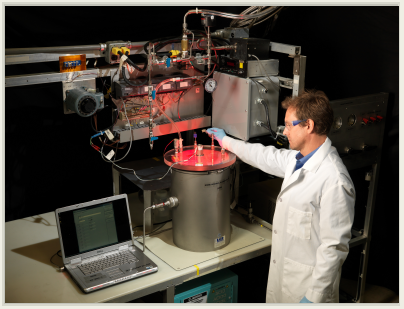
Project Introduction

The Brine Residual in Containment (BRIC) system is a technology that enables recovery of water from concentrated brine wastewater. Recovery of water from concentrated brines is a major technology gap in the closure of a water recovery system. The BRIC concept aims to address specific challenges associated with designing reliable systems that can approach 100% water recovery from brine. These issues include the collection and handling of sticky and potentially toxic brine solids that tend to foul process equipment and reduce the overall efficiency of heat transfer and solids removal.

Year 2 of project: The project continues the development of a microgravity-compatible BRIC evaporation chamber. The current BRIC system is a low-fidelity system/component breadboard used to demonstrate the basic functionality of an "in-place" brine drying process. Under the current BRIC IR&D project, significant progress has been made in the development of a microgravity-compatible BRIC evaporator design. These advancements include a number of potential BRIC evaporator design concepts employing novel static phase separation approaches based on capillary and surface tension phenomenon. These design concepts have been furthered through the design and development of sub-scale test articles and methods for testing these systems under conditions of microgravity. Data collected through this test program has highlighted the need to further refine the design and validate the performance of a BRIC system for brine dewatering applications in microgravity. Year 1 of project: Data describing the physical properties and drying behavior of brines, including vapor pressure equilibria, emissivity, specific heat, surface tension, and cohesion/adhesion and tack were determined as a function of the brine drying process. Brine is generated using a rotary evaporator (Buchi, model K100) from human donated urine, augmented to match characteristics of urine produced on the International Space Station (ISS). Brine solids were produced using the pre-prototype BRIC system. In addition, sampling of the gas effluent of the system was conducted in partnership with the Space and Life Sciences Toxicology Laboratory to address concerns regarding hazardous gases that may evolve during the drying of brine solutions.

Anticipated Benefits

The BRIC technology will be infused into a system-level environmental control and life support system, supporting deep-space habitats or other exploration missions. The system will be demonstrated through integrated testing conducted by the Advanced Exploration Systems program as well as thorough microgravity testing in a microgravity aircraft. If successful, the technology will be proposed for demonstration in a Deep Space Habitation test bed or as an ISS detailed test objective. The technology could be integrated with the ISS life support system to recover brine wastewater currently discarded on-orbit.



Project Image Brine Recovery in Containment (BRIC)

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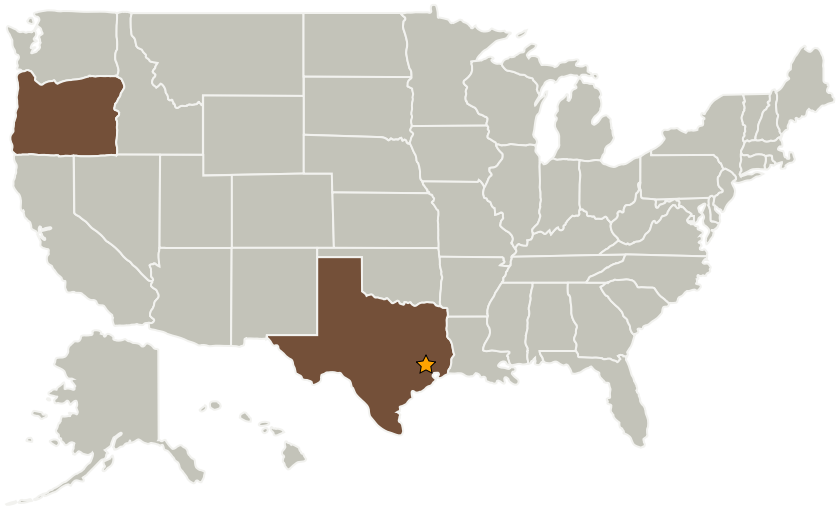
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Portland State University	Supporting Organization	Academia	Portland, Oregon

Co-Funding Partners	Type	Location
Portland State University	Academia	Portland, Oregon

Primary U.S. Work Locations	
Oregon	Texas

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Carlos H Westhelle

Project Manager:

Karen D Pickering

Principal Investigator:

Karen D Pickering

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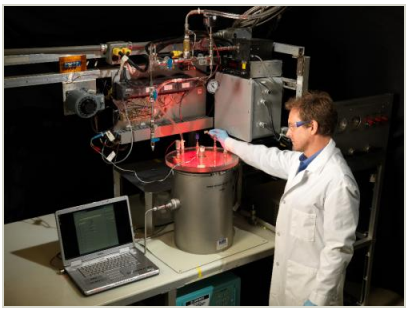
Images



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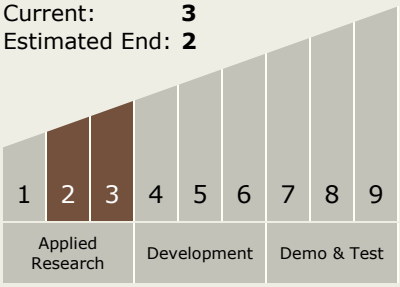
Project Image Brine Recovery in Containment (BRIC)
(https://techport.nasa.gov/image/2343)

Links

NTR 1
(http://The BRIC concept is described in technology disclosure MSC-24964-1, which will be published in an upcoming issue of NASA Tech Briefs)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **2**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management